

NOTES FROM THE NOVEMBER REPORTS OF THE CLIMATE AND CROP SECTIONS.

ARIZONA.

Mr. W. G. Burns, section director, remarks that—

A period of drought, remarkable, not so much on account of its duration as for its extent, prevailed in Arizona from September 12 to November 18, inclusive. * * * Taking into consideration the varied topography of the Territory, its vast area of 113,000 square miles and its changing meteorological conditions, it is remarkable that this drought prevailed for so long a period.

Arizona lies between the area of high pressure over the Pacific and under the Tropic of Cancer and the corresponding high area over the Atlantic and the Gulf of Mexico. Between these tropical areas (which would probably be continuous belts of high pressure if the earth had a uniform surface of water), the equatorial belt of low pressure intrudes by sending an arm of low pressure along the coast of Central America northward up the Gulf of California into Arizona. The rains that come to Arizona vary with the presence, or absence, of this extension of the equatorial low and if drought prevails in Arizona it is apt to be only a portion of the area of drought extending northward over California.

CALIFORNIA.

The deficiency of precipitation, on the average for 162 stations, was 1.20 inches, or about 55 per cent of the normal, reckoning the latter at 2.20 for the whole State. There seems to have been abundant rainfall in the extreme north, but little or nothing in the southern half and the central valley. This area of drought, therefore, adjoins that in Arizona and southern Nevada, and one common cause must have produced the whole.

Mr. E. L. Coethen communicates some remarks on protection from frost, from which we infer that close wind-breaks at right angles to the flow of cold air cause low temperatures on the upper side. A block of large trees below a block of smaller trees would have the same effect. Fires at these points will drain off the cold air; flowing water is a help, but not sufficient in itself; clean culture and a wet surface are the best conditions of the soil. Firing of any kind is beneficial, if there is enough of it. Twenty to fifty coal baskets per acre will be needed according to the location and size of grove. A little burning straw is a snare and deceit; dry straw is of little value; smudge from wet straw should be dense and cover large areas and be lighted early. Coal baskets should be filled at the start and replenished before the fire is too low, they need less attention than smudge. Oil fires do good work, but the smoke is objectionable. Evaporating pans give no visible results. An awning or cover was found to be of great service in the orchards at Riverside.

FLORIDA.

Mr. A. J. Mitchell, in speaking of the protection of orange groves, says:

Heroic remedies are necessary, and it is very generally conceded that the only measure that promises success is the use of fires supplemented by other forces. Experience has forced the recognition of the importance of dry heat as the only safe recourse when the temperature falls to 20° or below. Many groves are now liberally provided with fuel, deposited at certain intervals and sufficiently near to cause a rise in temperature when ignited. Mr. G. P. Kinney, of Pierson, says that during the winter of 1897-98 he had to keep his fires going for nine nights, which was the longest period during the past five years. He places little piles of fuel between each of his trees and can fire an acre in a few minutes. He found that firing every fourth pile raised the surrounding temperature 5°, and firing every third pile, 7°; by firing all the piles the temperature rose 15°.

The report of the Lake County Horticultural Society gives the result of an experiment made October 15, in partly cleared pine woods, where 30 fires were placed 50 feet apart each way; the thermometers were in the middle of each square and on the leeward of the fires, 5 feet from the ground. The fires were started at 8 p. m. and kept up for three

and a half hours; the size of the fires was regulated so as not to injure an orange tree 17 or 18 feet to the leeward. There was very little wind and the dew-point was reached early in the evening. The air temperature was 63° at 8:30 and 60° at 11:45 at a distance from the fires; the average rise of the thermometer was 3.5° to 4°, and a few thermometers, placed 10 feet from the ground, averaged 2° higher still. Two and a third cords of wood were burned, of which one-half was light pine and one-half green pine. This report is one of many that will be made this winter, and every such series of exact experiments and measurements give valuable data for determining what can be done under any given condition.

GEORGIA.

Mr. J. B. Marbury says that the value and development of the peach interest in Georgia has necessitated methods of protection against frost. During the spring of 1898 several damaging frosts occurred, but answers from a number of peach growers showed that the location of the orchards is very important, and that quite a number escaped damage although no protection was used. Without an exception, orchards on high ground fared better than those on low ground; when an orchard extended from the hills down into the valley, little or no damage was done on the hill while trees in the valley had all the fruit killed. Orchards in the lowlands when properly protected by smoke did not suffer. Smoke made from coal tar was used by Mr. John D. Cunningham, who says:

It not only produces a dense smoke but prevents the ravages of the curculio. I left several portions of my orchard unsmoked, and these portions were injured by curculio, the others were not. This is the general testimony of the other cultivators of peaches and plums. In general, nearly all that were thoroughly smudged were saved, while a large percentage of unprotected fruit was lost.

[If the curculio can be thus easily checked, that alone would make it worth while to smudge with coal tar smoke.—Ed.]

ILLINOIS.

Mr. Charles E. Linney states that from 201 reports of loss by lightning, during May-October, 1898, in Illinois, he concludes an aggregate loss of \$43,000.

A survey of the reports shows a very marked increase in the loss of stock due to the wire fence, and the urgent need of frequent ground wires on those in use; a largely increased loss of barns and granaries during the harvest season, probably due to storage of new grains and grasses; slightly more danger to stock on wet than on dry lands; lack of any marks upon stock in most instances; the general movement of thunderstorms from west or southwest to east and northeast; a very large number of buildings struck but damaged only slightly; and, finally, an area of marked frequency in losses covering the northwest counties especially, and the northern district as a whole, with an apparent absence of losses in central counties.

IOWA.

Mr. J. Russel Sage having, in his summary for October, shown that a large portion of the cattle injured by lightning were at the time standing in close contact with wire fences, and having also shown that by providing these fences with ground wires the loss of live stock may be greatly diminished, the Farmers' Voice of Iowa publishes the following comment upon this improvement by Mr. Sage:

We may scarcely overestimate the importance of investigations of this kind, tending as they do to reduce to the minimum the destruction of life and property by lightning. Properly protected barns and houses, scientifically constructed wire fences, and the many precautions which as a consequence will be taken must result in increased immunity from the blighting effect of this death-dealing element. Farmers everywhere owe Mr. Sage a debt for his timely and intelligent efforts.

Weather forecasts in England are favorably considered by a writer in the London Standard, who says:

The forecasting of our meteorological office in London is based on long observation and an inductive system. * * * The prophets sometimes prophesy falsely, but for this, as we shall see, they are generally not to blame. During the twelve months ending with March, 1898, they were fully successful in 55 per cent, and partially so in 26 per cent; of the remainder only 6 per cent were complete failures. This

81 per cent of verifications is within the range of 79 to 84 that has prevailed during the past ten years. Of the storm warnings nearly 92 per cent were justified. Of the forecasts of rain for the hay harvest season, 90 per cent proved useful. The successes are most numerous on the eastern side of England, and least so in Ireland and the west and north of Scotland. Most of our bad weather comes from the Atlantic and the observers get no intimation of its approach until it is near the western shore. As we live in an island country, with an ocean on the west, we must put up with a changeable climate and occasional failures in weather forecasts.

LOUISIANA.

Mr. Alexander McAdie continues his papers on the formation of frost by one on the methods of fighting frost, and considers especially the great freeze of February, 1895. He says:

On the morning of February 7, 1895, when the temperature was 40° at New Orleans, the forecast was made that, in all probability, a temperature of 15° would be reached by the morning of the 8th. The temperature actually recorded at the time mentioned was 16°, being a fall of 24° in twenty-four hours, and a remarkable verification of the forecast. This is important, because it signifies that warnings can be given sufficiently long in advance to permit of active measures by smudging, screening, warming, or flooding.

The weather map of February 6 may be taken as typical of the conditions preceding heavy frosts or freezing weather. An area of low pressure is found to overlie Louisiana and Mississippi, while over Manitoba an area of high pressure exists. The high area moving rapidly southward brings about a great cooling of the air and the first step in the formation of frost is thus accomplished. To protect successfully, then, every fruit grower must watch the weather map. He should be in communication with the Weather Bureau. He should also provide himself with a reliable thermometer which should be read carefully about 10 o'clock at night whenever conditions are favorable for frost. The thermometer should have a free exposure, and should be read some distance from the house. Two readings should be made, one with the thermometer five feet above the ground and one about six inches from the ground. The bulb of the thermometer should then be dipped in clean water of the same temperature as the air. With the bulb thus wet, the thermometer should be whirled for about three minutes at the end of a string about two feet long. If properly done, the temperature will be found to read several degrees lower than before. This difference between the dry and wet readings is of great importance. In a rough way, by doubling this difference and subtracting it from the dry temperature, one can obtain the dew-point or a temperature a little above it. When the dew-point is below 40°, the fruit grower should remain on guard, take further readings, and begin to light the smudges. For example, if the temperature of the air is 42° and the wet bulb reading 38°, the difference, 4°, doubled and subtracted from 42°, gives the dew-point as 34°. This rule holds where the differences are small as, in general, they are likely to be in Louisiana. These instructions are intended for those who have but one thermometer. For those who have sling psychrometers, more specific instructions are available.

Having thus forewarned himself, as it were, of the approach of frost, the fruit grower is ready to consider the ways by which the injurious effects of frost can be counteracted. It will be well to study natural conditions preventing frost. We find that on dates when frost was expected but did not occur, one of several conditions occurred. Either strong northerly or northwesterly winds blew during the night and thus thoroughly mixed the air, preventing the formation of pools of stagnant cold air; or there were moderate southerly or southeasterly winds, warm and laden with moisture; or the night was cloudy or foggy. In brief, the natural preventives of frost are thorough mixing, warming, adding moisture, and screening.

Mr. McAdie then gives some account of artificial methods of protecting against frost and, especially, brings before the notice of the planters in Louisiana some of the results of the work done in California under the stimulus of Mr. Hammon, whose newest bulletin on the subject is now in press.

MARYLAND AND DELAWARE.

Mr. F. J. Walz gives an outline of the plan to be followed by the Maryland and Delaware section in the climatic studies that are now in progress. The plan of work includes the history of local climatology, the description of instruments and the general characteristics of weather and climate. Also, the fullest details as to temperature, precipitation, humidity, cloudiness and winds.

MISSISSIPPI.

Mr. W. T. Blythe very properly says:

The record of unusual phenomena made by some observers, under the head of "Remarks" on their monthly reports is highly appreciated and enhances the value of their work in cooperation with the Weather Bureau. Special value attaches to their statements concerning the crops and the weather. There is no better agency than the monthly Section Reports through which to make known to the world the climatic features of the State and its agricultural possibilities.

MONTANA.

Mr. E. J. Glass states that the weather for the month of November is generally characterized by a cold wave which heralds the first approach of winter. During the present November, this cold period occurred on the 19th at nearly all stations in Montana and lasted for several days, the coldest temperatures were reported on the 21st. The maximum of 4° on the 19th at Glendive was 45° below the maximum on the day preceding. Only three stations escaped the cold wave on the 19th, and these were situated in the extreme western portion of the State. The warmest part of the State was that west of the Rocky Mountain Divide, and the coldest was the extreme northeastern portion. (This accords with the general experience that the cold air flowing from the north southward keeps to the lowlands). At Glendive, the Yellowstone River froze on the 21st, five days earlier than any previous record. At Missoula, on the evenings of the 29th and 30th, the wind was blowing a gale from the east out of Hellgate Canyon while clouds, at about 1,000 feet altitude, were going in an opposite direction from the surface winds. Such a phenomenon as this must stimulate local meteorologists to determine the cause of this lower opposite current. If it were 10,000 feet deep, then, one might conclude that the westerly wind striking the main divide at the head of the canyon deflected downward; but the mountain tops are not high enough above Missoula to justify this explanation. More likely, the lower current was due to the cooling of the air in contact with the sides of the canyon and was, therefore, of very moderate depth, perhaps 1,000 feet, a depth that could have been determined by flying a kite or by climbing up the sides of the canyon. If this be the true explanation, then an explorer with a sling thermometer should find the temperature of the air slightly warmer at great heights than in the valley below, showing that the lower or eastern wind is simply the underflow of cold air down the valley. If, however, the temperature grows colder with ascent, then the question would, primarily be, whether it diminishes according to the adiabatic rate of 1° F. for 183 feet.

NEBRASKA.

Mr. G. A. Loveland republishes an excellent article on snow crystals by G. H. Perkins of the University of Vermont, that first appeared in Appleton's Popular Science Monthly for May, 1898. The Editor hopes to present a summary of some of Mr. Perkins' conclusions in a future number of the MONTHLY WEATHER REVIEW. It is a matter of regret that the Weather Bureau observers have not as full access to scientific periodicals as their needs require. The Chief of the Weather Bureau has arranged to have a few scientific journals circulated among the stations, but much more is desirable in this direction. Of late years Appleton's Popular Scientific Monthly has contained numerous popular and instructive articles on matters pertaining to meteorology, climatology, and physical geography. Among these we note the following titles in Vol. LIII, June to October, 1898: Page 307, "Prindle on weather forecasts;" page 467, F. W. Felch, "The aurora;" page 48, G. J. Varney, "Kite-flying in 1897;" page 75, G. H. Perkins and W. A. Bentley, a "Study of snow crystals;" page 577, G. W. Spencer, "Geological waterways across Central America;" page 789, F. L. Oswald, "Weather

freaks of the West Indies." Besides these meteorological articles are numerous others relating to allied branches of science.

NEVADA.

Mr. R. F. Young publishes some interesting remarks by Mr. Daniel Bonelli, illustrating the climate and crops of southern Nevada, who says:

This region is very different from the distinctly Northern States in that our growing season is longer by several months than in other portions of the State. We usually have no frost here until in November, and our last crop of alfalfa, usually the sixth, and sometimes the seventh, is not cut until the end of November, and sometimes just before Christmas.

The drought affecting southern California and Arizona has also prevailed over southern and northwestern Nevada.

NEW ENGLAND.

Considerable space is given by Mr. J. W. Smith to the great storm of the 26-27th, which "dwarfs all other meteorological features of the month." The estimated maximum wind velocity at Block Island was 97 miles by the Robinson anemometer, but of course, the individual gusts must have been more severe. Not in the history of the present generation has there been such a record of devastation and death on the coast of New England.

NORTH CAROLINA.

An earthquake shock was reported on November 25, as follows: Mount Pleasant, 3:10 p. m.; Abshers, about 3 p. m.; Charlotte, 3:05 p. m.

SOUTH CAROLINA.

Mr. J. W. Bauer has started a little investigation in order to ascertain what effect the weather has on colds, or what weather conditions are most favorable for catching cold. He finds that there is a direct relation between both the inception of colds and the increased severity of standing cases and an abnormal or unusually wide range of daily temperatures. The coughing spells of persons afflicted with a cold were generally more severe after sunset when there was a rapid lowering of temperature, unless the persons were in a very warm room during that time, or were taking active exercise out of doors. If persons are more liable to catch cold when the daily range of temperature is abnormally wide, then the weather forecasts will take on a new value. It occurs to the Editor that, in the coldest part of the day, the temperature is apt to fall so near to the dew-point that the particles of dust floating about become coated with moisture, and settle so rapidly toward the ground that when we go out of doors, we breathe in an unusually great number of irritating cold particles of moisture and, possibly, even the germs of disease. The irritation that produces a cough may be due quite as much to the cold particles that are caught by the lungs as to the cold air itself. Will not some of our observers, regular and voluntary, try the experiment of breathing the cold air in through a handkerchief, or some better form of respirator, arranged to catch the dust and fog but allow the clean air to pass through.

TENNESSEE.

The observer at Madison, in Davidson County, reports:

On the night of the 14th, many extremely brilliant meteors were observed, completely traversing the heavens from northeast to southwest; as many as six were visible at one time; many were so brilliant that objects could be seen fifty yards away as readily as by moonlight. This shower of meteors lasted from 8:15 p. m. of the 14th to 12:20 a. m. of the 15th.

Although several observers have reported individual bright meteors during November, yet this is the first notice that we have seen of anything like a shower of meteors. Such showers are pretty sure to occur somewhere on the earth during

November 10-14 every year, and although these shooting stars are of little importance to meteorologists, yet the astronomers are sufficiently interested in them to issue instructions for the guidance of those who desire to make useful observations.

UTAH.

Mr. J. H. Smith, section director, expresses the pleasure it gives him to issue the first number of the report for Utah in the standard printed page. We believe this, therefore, celebrates the disappearance of publications by the milleograph process. This process was invented by the officials of the Weather Bureau less than ten years ago at a time when some method of publication was imperatively called for, but when the ordinary printing press was supposed to be too expensive a luxury. But time has shown that the Bureau can not afford to publish its valuable records in any temporary or imperfect manner. Newspapers, carbon or manifold copies, the mimeograph, the milleograph, and even the lithograph methods are apt to be regarded as fit only for temporary use. It is, at the present time, impossible to obtain many complete sets of these early publications of the Weather Bureau. On the other hand, the present printed quarto monthly reports can be bound into handsome volumes, and will a century hence be available for studies in climatology. Few of us can realize the numerous and novel uses that will hereafter be made of our published climatological data.

VIRGINIA.

The Editor takes the liberty of repeating his former words appreciative of the good taste shown in the colors of the base map printed in the reports of the Virginia section. Most of the section reports show the base map in blue and the isobars and isotherms in red, a few give both in black, but Mr. Evans has chosen old gold for the base, and a blue-black for the meteorological lines. Harmonious combinations of colors are always to be preferred. Good taste is as conspicuous on the printed page as anywhere else.

WISCONSIN.

Mr. W. M. Wilson, section director, reprints an excellent article from the Milwaukee Sentinel, describing the weather service in the West Indies. In this article Professor Moore states that the present Secretary of Agriculture, Mr. James Wilson, instructed him to increase the usefulness of the Weather Bureau as much as possible, and, especially, to extend its benefits as far as possible to those sections of the country that have heretofore been neglected. It was Secretary Wilson who conceived the idea of extending the weather service of the United States over the islands in the Gulf of Mexico and the Caribbean Sea. In less than one month from the time that Congress authorized the extension, twelve observers were sent to as many islands in the West Indies, the stations were fully equipped, the meteorological apparatus set up and arrangements made for cabling observations to Kingston and to Washington twice daily. Our observers had scarcely reached their stations when the most destructive hurricane since 1860 began to form to the southeast of the island of Barbadoes.

WYOMING.

Mr. W. S. Palmer, section director, gives a suggestive table, showing the mean temperature for the whole State and for each November from 1891 to 1898; also, the average precipitation over the whole State, year by year. The normal, or average for eight years, is, temperature, 31° F., and precipitation, 0.76 inches. But the point to which we wish to call attention is not mentioned by him, viz, that the years of higher temperature are, also, years of small precipitation, and the years of low temperature have rather large precipitation.

By rearranging Mr. Palmer's table in the order of temperatures, we get the following result:

Year.	Temperature.	Precipitation.
	°	Inches.
1896	24	1.06
1898	28	0.83
1895	30	1.30
1893	31	0.79
1891	33	0.60
1897	33	0.68
1892	35	0.50
1894	37	0.28
1895.5	28.2	0.97
1893.5	34.5	0.52

By averaging the first four and the last four years, we get values for the two groups, as shown in the last two lines of this table; and there can be no doubt but what there is a definite relation between the average November temperature and the total November rainfall. Similar relations exist for nearly all parts of the globe. A large precipitation generally means a proportionately large amount of cloudiness and, therefore, a small amount of sunshine. There are, however, some regions where the heat received from the sun during clear weather is so small that a continuous cloudy layer, acting as a blanket to prevent radiation, maintains a higher temperature while at the same time giving more precipitation.

NOTES FROM THE DECEMBER REPORTS OF THE CLIMATE AND CROP SECTIONS.

ALABAMA.

Mr. F. P. Chaffee notes that during a severe hailstorm at Montgomery on December 2, lasting about four minutes, there was no unusual change either in temperature or pressure, such as usually accompany the fall of hail during the summer season. The rapid oscillations of the barometer during hailstorms, as shown by a barograph record, are not yet completely explained. Doubtless, in many cases a satisfactory explanation can be given, but not in other cases. A comparative study of the hailstorms without barometric fluctuations, as compared with those that show such, would doubtless be very instructive.

ARIZONA.

Mr. W. G. Burns notes that the month has been remarkable for the general severity of the weather, the average deficiency of temperature was nearly 5°, a snowstorm prevailed on the 9th and 10th, over three-fourths of the Territory, and the fall amounted to nearly 30 inches at some mountain stations. But notwithstanding this unusual phenomenon the citrus fruit did not seem to have suffered any injury. It is hard to believe that such unusual weather in Arizona may not be followed by similar unusual cold and snow over the regions to the eastward. Thus, we notice that in New Mexico the month has also been very cold, the average for the State being below the normal with an unusual amount of snow in the mountains. Arkansas shows 3.9° below the normal, but the average rain and melted snow was not above but rather below the normal. Louisiana gave a temperature of 5.2° below the normal, but the precipitation was also below. In general, therefore, as we proceed eastward from Arizona, the temperature was uniformly below the normal, but the excess of rain and snow which prevailed in the Rocky Mountain region, disappears as we approach the Mississippi River and enter the region where low temperatures are produced by the southward flow of the cold, dry northerners. This antithesis between cold, wet weather on the west, and cold, dry on the

east is but an ordinary case illustrating the great variety of combinations that occur in climatology.

CALIFORNIA.

The report for December prints quite an extensive memoir by Dr. Marsden Manson, on the laws of climatic evolution. This is a problem that has always interested the geologist, but has, of course, very little to do with the practical problems of modern meteorology. As a rule we must utilize our knowledge of present conditions in order to throw light upon the nature of the climates that prevailed in past ages, and we can scarcely utilize the latter in studying current climatology. As Mr. Manson's memoir will, probably, be published in the Proceedings of the British Association for the Advancement of Science, it will, doubtless, attract the attention of the geologists who are especially interested in it, and who, if we mistake not, have already taken into consideration the special ideas that Mr. Manson has dwelt upon. The same mail brings us the latest discussion of this subject by Lord Kelvin in a pamphlet entitled *The Age of the Earth*, published by the Victoria Institute in London. The study of this pamphlet shows us that, even after making the most generous allowances, the subject is still beyond our grasp. The exact scientific work of the last century has not yet afforded a sufficiently secure basis for argument as to what was the temperature of the earth's crust, or the condition of the earth's atmosphere millions of years ago. Still men must attempt to reply to the questions that crowd upon us when we study geology and paleontology. It becomes evident that there must have been some form of climatic evolution, but the best theories that we can elaborate to-day are liable to be upset to-morrow, because they have involved so many assumptions and must give place to facts when these have been established by the general progress of knowledge. We would not discourage scientific speculations as they play an important part in stimulating the search for facts to support them; but when facts and principles are once well established, these constitute science, and the speculations with which they did not harmonize, give place to something else nearer the truth.

COLORADO.

With regard to snow in the mountains, Mr. F. H. Brandenburg says:

While it is true that more snow usually falls after January 1 than before that date, agriculturists of Colorado and abutting territory attach great importance to the amount received early in the winter, for these snows solidify, and consequently do not melt until late in the season, thus furnishing a water supply after the snows of spring have melted and passed off.

He adds that during December the snowfall has been very large, the temperature low, and the winds high. These are the conditions that usually go together in mountainous countries. He ventures general predictions as to the amount of water that will be available for irrigation during the summer season of 1899, which we condense as follows:

Arkansas watershed: the flow will be much greater than in 1898, and of longer duration. South Platte watershed: the flow will be much greater than for a number of years, and be prolonged beyond the usual time. Rio Grande watershed: a heavy and prolonged flow. Gunnison watershed: the flow will be very close to the normal. Grand watershed: prolonged and plentiful water supply.

GEORGIA.

Mr. J. B. Marbury publishes a detailed letter from Mr. T. O. Skellie, who maintains that the failures in the peach crop have been generally due to frost, and can be prevented by a proper attention to frost protection, either by smudges or by any other practicable means.